PTO 04-2878 HAMT

Japanese Patent
Document No. 07-332422

PISTON ROD GUIDE OF HYDRAULIC PRESSURE SHOCK ABSORBER
[油圧緩衝器のピストンロッドガイド]

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UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. 04/2004

Translated by: Schreiber Translations, Inc.

Bibliographic Fields
Document Identity
(19) [Publication Office]

Japan Patent Office (JP)

(12) [Kind of Document]

Unexamined Patent Publication (A)

(11) [Publication Number of Unexamined Application]

Japan Unexamined Patent Publication H7-332422

(43) [Publication Date of Unexamined Application]

22 December 1995 (H.7)

(43) [Publication Date of Unexamined Application]

22 December 1995 (H.7)

(54) [Title of Invention]

PISTON ROD GUIDE OF HYDRAULIC PRESSURE SHOCK ABSORBER

(51) [International Patent Classification, 6th Edition]

F16F 9/32

[FI]

F16F 9/32 Q

[Number of Claims]

2

[Form of Application]

FD

[Number of Pages in Document]

6

[Request for Examination]

Not Requested

(21) [Application Number]

Japan Patent Application H6-140764

(22) [Application Date]

31 May 1994 (H.6)

(71) [Applicant]

[Identification Number]

929

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(57) [Abstract]

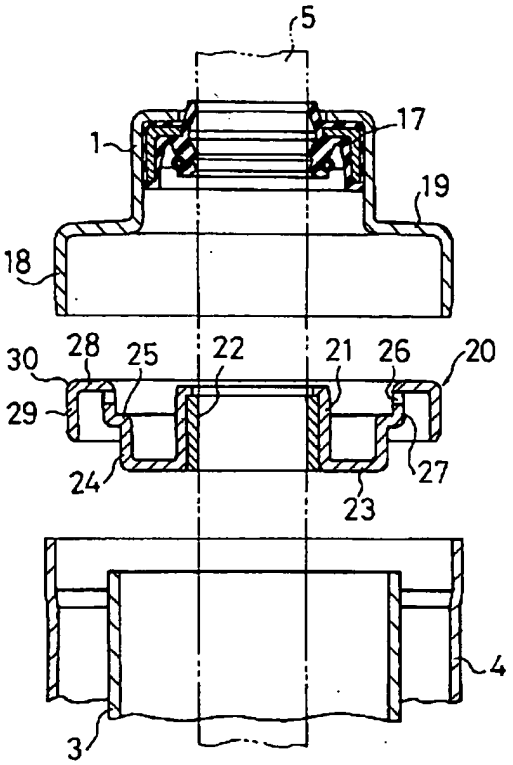
[Objective]

By making a piston rod guide of a hydraulic shock absorber by press molding, the piston rod guide can be light weight, and can be manufactured at lower cost, while it maintains its guiding function and assembling efficiency satisfactorily.

[Constitution]

The piston rod guide of this invention comprises from inner to outer: a cylindrical portion 21 for fitting a guide bush; a flat portion 23 for catching a piston-side rebound rubber, which extends in the horizontal direction from the lower edge of the cylindrical portion 21; a cylindrical portion 24 for fitting a cylinder, which vertically extends upward from the outer perimeter of the flat portion 23 being concentric with the cylindrical portion 21; a flat portion 25 for receiving a cylinder edge, which is formed at the upper edge of the cylindrical portion 24; a cylindrical portion 27 having a through hole 26 for returning hydraulic oil, which vertically extends upward from the outer perimeter of the flat portion 25; a flat portion 28 for receiving a packing case, which extends in the horizontal direction from the upper edge of the cylindrical portion 27; and a cylindrical portion 29 for fitting a packing case, which vertically extends from the outer

perimeter of the flat portion 28 being concentric with the cylindrical portions 21 and 24.



[Claim(s)]

[Claim 1]

A piston rod guide of a hydraulic shock absorber, comprising from inner to outer:
a cylindrical portion for fitting a guide bush;
a flat portion for catching a piston-side rebound rubber, which extends in the horizontal direction from the lower edge of said cylindrical portion for fitting a guide bush;
a cylindrical portion for fitting a cylinder, which vertically extends upward from the outer perimeter of said flat portion for catching the rebound rubber, being concentric with said cylindrical portion for fitting a guide bush;
a flat portion for receiving a cylinder edge, which extends in the horizontal direction from the upper edge of said cylindrical portion for fitting cylinder;
a cylindrical portion having a through hole for returning hydraulic oil, which extends from the outer perimeter of said flat portion for receiving a cylinder edge;
a flat portion for receiving a packing case, which extends in the horizontal direction from the upper edge of said cylindrical portion having a through hole; and
a cylindrical portion for fitting a packing case, which vertically extends downward from the outer perimeter of said flat portion for receiving packing case being respectively concentric with said cylindrical portion for guide bush and said cylindrical portion for fitting a cylinder.

[Claim 2]

The piston rod guide of a hydraulic shock absorber as in claim 1, wherein a round portion is formed at the outer perimeter of the upper end of said cylindrical portion for fitting a packing case.

[Description of the Invention]

[0001]

[Field of Industrial Application]

This invention relates to a piston rod guide of a hydraulic shock absorber for guiding into a cylinder a piston rod, which extends outward from the inside of the cylinder.

[0002]

[Prior Art]

A piston rod guide of a conventional hydraulic pressure shock absorber is generally made through a so-called sinter molding method, in which alloy powder is filled in a mold and molded by compression molding, and then sintered in a high-temperature furnace.

[0003]

According to this method, a piston rod guide can be manufactured maintaining high precision of dimensions of respective parts.

[0004]

However, since a hollow product, which is lighter weight, can not be made by this method, the product has to be heavier. In addition, since this method requires many processing steps and high energy, and therefore requires higher manufacturing cost.

[0005]

Under this situation, as disclosed in Unexamined Japan Utility Model Publication No. H5-47569, there have been attempts of making a piston rod guide by press molding in order to make it lighter and to reduce the manufacturing cost.

[0006]

More specifically, in the piston rod guide made by press molding, a cylindrical portion for fitting a guide bush is formed at the inner circumferential edge, and a flat portion for catching a piston-side rebound rubber horizontally extends outward from the lower edge of the cylindrical portion.

[0007]

Furthermore, a cylindrical portion for fitting a cylinder vertically extends upward from the outer perimeter of the flat portion for catching the rebound rubber, being concentric with the above-described cylindrical portion for fitting a guide bush. In addition, an annular groove for cylinder edge to escape thereto is formed at the upper edge of the cylindrical portion for fitting a cylinder.

[0008]

The upper edge of the above-described annular groove horizontally extends further outward so as to form a flat portion for receiving a cylinder edge.

[0009]

Furthermore, the outer perimeter of the flat portion for receiving the cylinder edge vertically extends upward so as to form a cylindrical portion having a through hole for returning hydraulic oil. The upper edge of this cylindrical portion is bent outward in the horizontal direction so as to form a flange-like flat

portion for receiving packing case.

[0010]

With this constitution, since the respective cylindrical portions and flat portions and annular groove can be made by press molding, the piston rod guide itself can be also manufactured through press molding.

[0011]

[Problems to be Solved by the Invention]

According to this constitution, since the piston rod guide can be manufactured by press molding, it can be manufactured at lower cost and the product is lighter weight in comparison with the one manufactured by sinter molding.

[0012]

On the other hand, as described above, the piston rod guide manufactured by press molding is designed to support the packing case simply by the flat portion provided at the outer circumferential portion.

[0013]

For this reason, at the time of assembling a hydraulic shock absorber, the piston rod guide and a rod seal cannot be put together in advance to make a subassembly, so that more manufacturing steps are required for assembling the hydraulic shock absorber.

[0014]

In addition, since the flat portion formed at the outer perimeter is flange-shaped, the length for engagement with the packing case is short, and the dimension of the outer circumferential portion is not as precise as that of the piston rod guide manufactured by sinter molding; therefore there is concern that the piston rod guide could be attached while tilting toward the outer tube.

[0015]

As a result, the guiding function as a piston rod guide will be deteriorated.

[0016]

Furthermore, even if the piston rod guide and the rod seal are to be attached to the outer tube by seam welding, since the portions to be welded do not have enough strength against pressure, the portions could be damaged by the pressing force at the time of seam welding. Therefore, those portions have to be jointed by caulking means, which results in poor productivity.

[0017]

In view of the above, the objective of this invention is to manufacture lighter piston rod guide for a hydraulic shock absorber at lower cost as a press molding product, and also to provide a piston rod guide for a hydraulic shock absorber whereby the guiding function of the piston rod guide and the assembling efficiency can be secured.

[0018]

[Means to Solve the Problems]

According to the present invention, the above-described objectives can be achieved by a piston rod guide

comprising from the inward to the outward: a cylindrical portion for fitting a guide bush; a flat portion for catching a piston-side rebound rubber, which extends in the horizontal direction from the lower edge of the cylindrical portion; a cylindrical portion for fitting a cylinder, which vertically extends upward from the outer perimeter of the flat portion for catching the rebound rubber being concentric with the cylindrical portion for fitting a guide bush; a flat portion for receiving a cylinder edge, which extends in the horizontal direction from the upper edge of the cylindrical portion for fitting a cylinder; a cylindrical portion having a through hole for returning hydraulic oil, which vertical extends upward from the flat portion for receiving a cylinder edge; a flat portion for receiving a packing case, which extends in the horizontal direction from the outer perimeter of the flat portion for receiving a packing case; a cylindrical portion for fitting a packing case, which vertically extends downward from the outer perimeter of the flat portion for receiving a packing case being concentric with the cylinders for fitting a guide bush and the one for fitting a cylinder.

[0019]

In addition, the outer circumferential portion of the upper edge of the cylindrical portion for fitting a packing case is preferably has round shape.

[0020]

[Working Principle]

In other words, according to the above-described constitution, a piston rod guide can be obtained as a press molding product that is light weight and can be manufactured at lower cost. In addition, since a cylindrical portion for fitting a packing case is formed at the outer circumferential portion and has round portion at the outer perimeter of the upper edge, the outer shape of the piston rod guide is similar to the conventional one manufactured by sinter molding.

[0021]

As a result, at the time of assembling the hydraulic shock absorber, the piston rod guide and the packing case can be put together to make a subassembly, using the cylindrical portion formed at the outer circumferential portion.

[0022]

Especially, in this case, if the outer circumferential portion of the upper edge of the cylindrical portion for fitting the packing case has a round portion, the piston rod guide can be smoothly inserted without having the upper edge of the cylindrical portion caught by the packing case.

[0023]

Furthermore, since the packing case and the cylindrical portion of the piston rod guide for fitting the cylinder are put together, the piston rod guide and the packing case can be correctly attached to the cylinder and the outer tube of the hydraulic shock absorber.

[0024]

As described above, the piston rod guide can be easily attached while maintaining its guiding function and assembling efficiency as a piston rod guide.

[0025]

In addition, as described above, since the outer shape of the piston rod guide is similar to the conventional one manufactured by sinter molding, the piston rod guide of this invention can be interchangeably used with the conventional one if the dimension of each part is made same as that of corresponding part of the conventional piston rod guide.

[0026]

Furthermore, since the piston rod guide and the packing case are first put together as a subassembly and then attached to the hydraulic shock absorber side, the welding portions of the packing case and the outer tube is fortified by the cylindrical portion of the outer circumferential portion of the piston rod guide, and the portions has larger strength against pressure; therefore the equivalent or higher quality can be expected in comparison with the sintered product even after welding.

[0027]

[Working Example(s)]

Referring now to the annexed figures, Working Examples of this invention will be described below.

[0028]

Fig. 3 shows an embodiment of a hydraulic pressure shock absorber which uses a piston rod guide of this invention.

[0029]

As is conventionally well known, the main body of this hydraulic shock absorber has a double tubular structure comprised of a cylinder 3 and outer tube 4, wherein the upper and lower ends are covered with a packing case 1 and a bottom cap 2 respectively. A reservoir chamber C is formed between the cylinder 3 and the outer tube 4.

[0030]

A piston 6 that bears a piston rod 5 is inserted in the cylinder 3 so as to be freely slidable. The inside of the cylinder 3 is partitioned by the piston 6 so as to form the upper oil chamber A and the lower oil chamber B.

[0031]

The upper oil chamber A and the lower oil chamber B are connected to each other through a rebound-side port 7 and a compression-side port 8, which are through holes vertically provided onto the piston 6, and also connected through a rebound damping force generating valve 9 and a check valve 10 for compression-side suction, which are arranged at the outlets of the rebound-side port 7 and the compression-side port 8.

[0032]

A base valve 11 is disposed between the lower end of the cylinder and the bottom cap 2. The lower oil chamber B and the reservoir chamber C are connected to each other through a compression-side port 12 and a rebound-side port 13, which are thru holes vertically provided onto the base valve 11, and also connected through a compression damping force generating valve 14 and a check valve for rebound-side suction 15, which are arranged at the outlets of the compression-side port 12 and the rebound-side port 13.

[0033]

The piston rod guide 20 of this invention is attached so as to fit over the upper edge of the cylinder 3 and the outer tube 4. A piston rod penetrates through the piston rod guide 20 and through the packing case 1, so as to extend outward from the piston 6.

[0034]

Inside the upper oil chamber, a rebound rubber 16 is fixed around the outer perimeter of the piston rod.

This rebound rubber 16 is designed to limit the maximum extending position of the hydraulic shock absorber by contacting against the lower surface of the piston rod guide 20.

[0035]

Because of this constitution, during the extending process of the hydraulic shock absorber, i.e. when the piston 6 moves upward, the hydraulic oil in the upper oil chamber A flows to the lower oil chamber B through the rebound side port 7 of the piston 6, opening the rebound damping force generating valve 9 by pressure. At this time, rebound damping force is generated by the flow resistance of the hydraulic oil that flows while opening the rebound damping force generating valve 9.

[0036]

At the same time, hydraulic oil, which is equivalent to the volume of the piston rod portion moved out from the cylinder 3, is supplied from the reservoir chamber C to the lower oil chamber B through the rebound side port 13 of the base valve 11, while opening the check valve 15.

[0037]

On the other hand, during the compression process of the shock absorber, i.e. when the piston 6 moves downward, the hydraulic oil in the lower oil chamber B flows into the upper oil chamber A through the compression side port 8 of the piston 6, opening the check valve 10.

[0038]

At the same time, hydraulic oil equivalent to the volume of the piston rod portion intruded into the cylinder is pushed out from the compression-side port 12 of the base valve 11 into the reservoir chamber C, while opening the compression damping force generating valve 14 by pressure. In this time, compression damping force is generated by the flow pressure of the hydraulic oil that flows while opening the compression damping force generating valve 14.

[0039]

In the above description, as understandable from the detailed drawing shown in Fig. 1, the inner circumferential edge of the piston rod guide 20 of this invention forms a cylindrical portion 21, and a guide bush 22 is held by the inner circumferential surface of the cylindrical portion 21, and guides the piston rod 5.

[0040]

The lower edge of the above-described cylindrical portion 21 is bent outward in the horizontal direction, and forms a flange-like flat portion 23 to limit the maximum extending position of the hydraulic shock absorber by contacting against the rebound rubber 16 (see Fig. 3) at the piston rod side.

[0041]

A cylindrical portion 24 to fit the piston rod guide 20 to the cylinder 3 is formed from the outer edge of the flat portion 23, being concentric with the cylindrical portion 21 to hold the guide bush 22.

[0042]

The upper edge of the cylindrical portion 24 is bent outward and extends in the horizontal direction so as to shape like a flange and form a flat portion 24 to limit the engaging position by contacting against the upper edge of the cylinder.

[0043]

A cylindrical portion 27 having a through hole for returning hydraulic oil is formed from the outer perimeter of the flat portion 25. The upper edge of the cylindrical portion 27 is bent outward so as to form flange-like shape in the horizontal direction, which is a positioning flat portion 28 used for positioning during subassembling by engaging the piston rod guide 20 with the packing case 1.

[0044]

The outer circumferential portion of the flat portion 28 extends vertically downward so as to form a cylindrical portion 29 that is concentric with the above-described cylindrical portions 21 and 24. This cylindrical portion 29 is used as a guide for subassembly by engaging the piston rod guide 20 with the packing case 1.

[0045]

More specifically, at the time of assembling the hydraulic shock absorber 1, subassembly is made by inserting the cylindrical portion 29 of the piston rod guide 20 along the lower cylindrical portion 18 of the packing case 1, in which an oil seal 17 is placed, until the flat portion 28 of the piston rod guide 20 contact with the lower surface of the flat portion 19 of the packing case 1.

[0046]

In this case, since the outer circumferential portion of the piston rod guide 20 has the cylindrical portion 29 formed from the flat portion 28, the precision of the dimension of the cylindrical portion 29 can be secured simply by press molding without machining such as cutting.

[0047]

Therefore, the piston rod guide 20 can be easily fitted to the packing case 1 without tilting, and the subassembling of those parts can be done without reducing productivity.

[0048]

In addition, at the time of the press processing, if the outer perimeter of the upper edge of the cylindrical portion 29 is shaped like arc so as to form a tapered portion 30, the lower edge of the cylindrical portion 29 can be smoothly inserted to the lower portion of the packing case without being caught by the lower edge of the packing case 1; therefore the assembling efficiency can be even more improved by this round portion 30.

[0049]

Subsequently, the subassembled unit of the packing case 1 and the piston rod guide 20 is pushed into the piston rod 5 through the respective oil seal 17 and the guide bush 22, and then fitted to the main body portion of the hydraulic shock absorber by attaching the cylindrical portions 18 and 24 to the upper edge portions of the outer tube 4 and the cylinder 3 respectively.

[0050]

As assembled as described above, the cylinder 3, the outer tube 4 and the piston rode 5 are kept concentric by the concentrically formed cylindrical portions 21, 24 and 29 of the piston rod guide 20. Also, the piston rod 5 and the oil seal 17 are also kept concentric via the packing case 1.

[0051]

At the same time, since the fitting portion of the lower cylindrical portion 18 of the packing case 1 to the outer tube 4 is lined by the cylindrically portion 29 of the piston rod guide 20, the deformation strength of

this portion becomes satisfactory even against a large pressing force (500-800 kg) during seam welding.

[0052]

Accordingly, the packing case 1 can be jointed to the outer tube by seam welding putting an electrode to the portion.

[0053]

As described above, the piston rod guide 20 of this invention can be made from a flat metal plate by press processing, whereby the piston rod guide 20 can be made lighter at lower cost.

[0054]

In addition, if respective portions of this piston rod guide are made so as to have dimension that fits to the piston guide prepared by sintering, it can be interchangeably used with the piston rod guide prepared by sintering.

[0055]

Fig. 4 shows an example when a check seal 32 is used in the hydraulic shock absorber with the piston rod guide 20 of this invention. In this example, the check seal is disposed on the flat portion 25 of the piston rod guide 20.

[0056]

A sheet ring 33 used for a "check seal function" with the check seal 32 is pressed to the oil seal 17 provided at the packing case side by a spring 34 placed between the check seal 32 and the sheet ring 33.

[0057]

Accordingly, it is understandable that the piston rod guide 20 of this invention is also applicable to a hydraulic shock absorber having so-called "check seal function". Here, "check seal function" means a function, whereby air flow suctioned from the reservoir chamber C into the upper oil chamber through inside of the packing case 1 is interrupted, but the flow of hydraulic oil from the upper oil chamber A to the reservoir chamber C through inside the packing case is allowed.

[0058]

[Effects of the Invention]

As described above, according to the invention of claim 1, the piston rod guide is light weight and can be manufactured at lower cost by making it with a press molding means. In addition, since the piston rod guide has a cylindrical portion for fitting a packing case, which is formed by further extending from the flat portion of the outer circumferential portion, the precision of dimension of the cylindrical portion can be achieved by press molding without machining such as cutting.

[0059]

Therefore, although the piston rod guide is a press molding product, it can be easily fitted to the packing case to make a subassembly without tilting, and the assembling efficiency with the packing case can be improved as well as the productivity of the piston rod guide.

[0060]

In addition, if the outer shape of the piston rod guide including the cylindrical portion formed at the outer

circumferential portion is made similar to the sintered product, the piston rod guide of this invention can be interchangeably used with the sintered piston rod guide while keeping its guide function for guiding the piston rod.

[0061]

According to the invention of claim 2, since the round portion is formed at the outer perimeter of the upper edge of the cylindrical portion for fitting a packing case, subassembly by putting the piston rod guide to the packing case can be smoothly done without having the upper edge of the piston rod guide caught by the lower edge of the packing case.

[Brief Explanation of the Drawing(s)]

[Fig. 1]

Vertical sectional front view of the major parts of an embodiment of the hydraulic shock absorber in this invention before assembly.

[Fig. 2]

Vertical sectional front view of major parts of the same embodiment as in Fig. 1 but illustrating the embodiment after assembly.

[Fig. 3]

Vertical sectional front view illustrating the whole hydraulic shock absorber having the piston rod guide of this invention.

[Fig. 4]

Vertical sectional front view of the major parts, illustrating another example of applications of the piston rod guide of this invention.

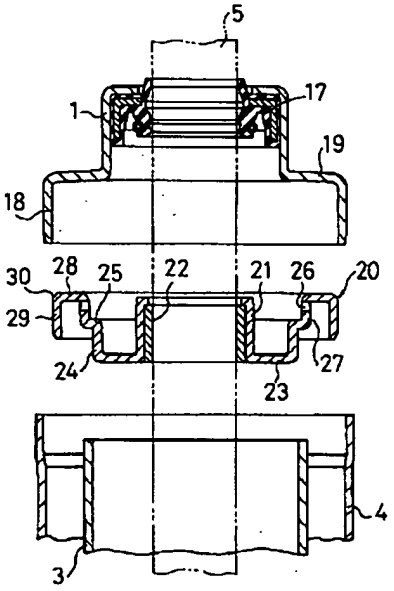
[Explanation of Symbols in Drawings]

1
Packing case
16
Rebound rubber
21
Cylindrical portion for fitting the guide bush
22
Guide bush
23
Flat portion for catching the rebound rubber
24
Cylindrical portion for fitting the cylinder
25
Flat portion for receiving the cylinder
26
Through hole for returning hydraulic oil
27
Cylindrical portion having a through hole for returning hydraulic oil
28
Flat portion for receiving the packing case
29

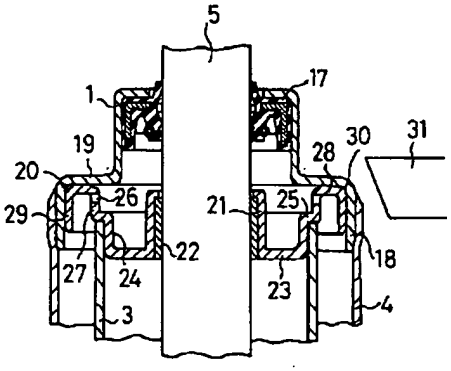
Cylindrical portion for fitting the packing case
3
Cylinder
30
Round portion
4
Outer tube
5
Piston rod
6
Piston

Drawings

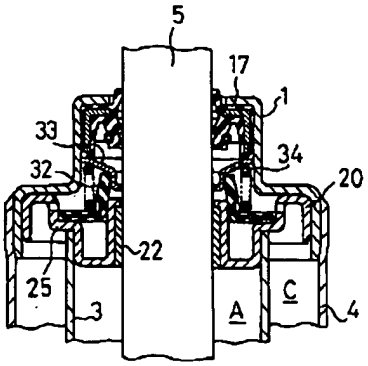
[Fig. 1]



[Fig. 2]



[Fig. 4]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17
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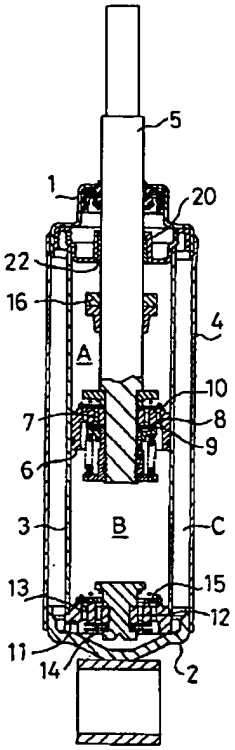
[Fig. 3]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